

GAO

Briefing Report to the Honorable
J. James Exon,
United States Senate

June 1987

ALTERNATIVE FUELS

Feasibility of Expanding the Fuel Ethanol Industry Using Surplus Grain



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United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-222735

June 30, 1987

The Honorable J. James Exon
United States Senate

Dear Senator Exon:

This briefing report responds to your October 23, 1985, letter requesting us to study the feasibility of using surplus federally owned grain to further the development of the ethanol industry. As agreed with your office, we examined two financing concepts: (1) producers/developers would use surplus grain as collateral to obtain financing from lending institutions to construct new ethanol plants or expand existing facilities and (2) producers/developers would use surplus grain as a free feedstock to produce ethanol, which could induce lending institutions to finance the construction or expansion of ethanol plants or facilities (i.e., the savings from using free feedstock could be used to help repay loans).

This briefing report presents information we provided your staff during an April 2, 1987, briefing. In summary, we found that surplus grain inventories are large enough to support these concepts. However, producers/developers and lenders were skeptical about the concepts' usefulness for expanding the industry, given the current slump in the ethanol market. Most of the ethanol producers/developers we spoke with said the concepts were feasible, and one-half said they would be willing to participate. Several would welcome the proposed assistance to help them maintain their businesses until conditions improve. Most lenders we spoke with had little interest in the grain-as-collateral concept but were somewhat more interested in the feedstock-as-inducement concept. Our analysis also showed that these concepts could reduce federal grain inventories and the associated storage costs. However, these savings could be more than offset by losses in federal gasoline tax revenues from the increased sales of gasoline blended with ethanol, which is taxed at a lower rate.

Department of Agriculture (USDA) officials told us it is unlikely that USDA would initiate these financing concepts unless directed by the Congress. In addition, USDA has the

authority to make surplus grain available for the production of ethanol, but there are legal restrictions on how the grain can be used. Insofar as possible, USDA must ensure that the grain provided to ethanol producers does not result in the displacement of other grain markets. To ensure compliance with this statutory directive, USDA requires that the grain only be used to make ethanol. These two limitations adversely affect the grain's value as collateral for financing because lenders could not sell the grain, in the event of loan defaults, on the open market.

Growth in the fuel ethanol industry has leveled off

The nation's ethanol industry emerged during the oil market turbulence of the 1970s. Ethanol, which is made primarily from corn, was used to extend gasoline supplies by blending 10 percent ethanol with 90 percent gasoline. The mixture is commonly referred to as gasohol. Since the late 1970s, federal and state governments have provided a variety of financial incentives, such as loan guarantees, low-cost grain feedstocks, motor fuel tax exemptions, and ethanol import tariffs, that were essential to the steady growth of the fuel ethanol industry. With the help of these federal and state incentives, the industry expanded rapidly, growing from an annual production of 20 million gallons in 1979 to 750 million gallons in 1986. In addition to the direct sale of ethanol, the revenues ethanol producers receive from the sale of corn sweetener and by-products, such as animal feeds, are also essential to profitable operations.

In 1986, there was a downturn in fuel ethanol prices resulting from a softening in ethanol demand because of competition from other gasoline-enhancing additives. This market downturn hurt the profitability of ethanol producers and forced the closing of some plants. In addition, ethanol producers told us that adverse publicity affected ethanol's marketability. For example, ethanol producers said that some oil companies' advertising campaigns that promote their gasoline as containing "no alcohol" have adversely influenced the public's acceptance of ethanol as an octane enhancer.

While most of the key incentives remain in place, there is considerable uncertainty among industry officials and lenders we visited regarding the federal government's long-term commitment to ethanol as an alternative fuel--particularly while fuel prices are relatively low.

Large inventories of surplus
U.S. grain exist

The growth in Commodity Credit Corporation (CCC) surplus grain inventories in recent years can be attributed in part to federal farm programs and market conditions for grain. Current inventories of CCC-owned grains total about 2.7 billion bushels and are taxing the CCC's ability to provide adequate storage. The cost to the federal government to store this grain is almost \$860 million annually. Although the government has disposed of some of the surplus grain through 1986 farm programs, large surplus inventories remain and are expected to continue through 1987. Further, another 7.5 billion bushels of grain are being held by farmers as collateral for CCC price support crop loans or are held in the farmer-owned reserve. If the market price of grain remains low, farmers' forfeiture of loan collateral could result in the CCC obtaining part or all of this grain, which would further increase surplus inventories.

Views on concepts to use surplus grain

During our discussions with ethanol industry officials about the possibility of using this surplus grain, we were told that it is not economically feasible to expand the industry at this time. Industry officials and lenders did not believe expansion of the ethanol industry was warranted until sufficient demand for fuel ethanol is generated and the prospects for profitable operations are improved.

Most of the 14 ethanol producers/developers we spoke with said the two financing concepts are feasible, and one-half said they would be willing to participate. Using an assumption that projects initiated under these concepts would be profitable, the nine lenders we spoke with had little interest in the grain-as-collateral concept but were somewhat more positive toward the grain-feedstock-as-inducement concept. Lenders were unwilling to participate in the grain-as-collateral concept if the grain could only be used to produce ethanol in the case of a loan default.

Lenders had a more positive attitude toward the grain-feedstock-as-inducement concept because it allows producers to use the free grain as an assured low-cost feedstock and apply the associated savings to repay construction loans. Alternatively, the producers said the fuel ethanol industry could be assisted by giving producers surplus grain to survive existing market conditions. The cost of grain used as a feedstock to make ethanol can represent 40 to 80

percent of ethanol production costs, according to industry officials. Other government actions to help the fuel ethanol industry that do not rely on surplus grain were also suggested.

Impacts of using surplus grain
on inventories, storage costs,
and tax revenues

Using surplus grain under the two concepts would probably have a small percentage effect on reducing the government's overall storage and maintenance costs for grain inventories. This is because the amount of grain that would be used for a reasonable expansion of the fuel ethanol industry would be small in comparison with the current 2.7 billion bushel grain surplus. For example, assuming producers were given a 3-year supply of grain during the first year these concepts were implemented and that industry consumption of grain increased 10 to 30 percent, the current grain surplus would be reduced by about 3 to 10 percent. This would reduce government storage and maintenance costs (using the CCC's estimate of about 31 cents per bushel per year on average) during the year the grain is given to producers by about \$28 million to \$85 million.

However, the current federal gasoline excise tax exemption could more than offset any potential reductions in federal costs from implementing either of the concepts. The federal government currently exempts 6 cents of the 9-cent federal gasoline excise tax on gasoline blended with 10 percent ethanol. Therefore, prior to the termination of this exemption, which is currently scheduled to expire in 1993, additional sales that result in the displacement of gasoline sales would result in lower tax revenue than if the full excise tax were collected on gasoline. The reduction in revenue would equate to about \$1.50 per bushel of grain used. We did not estimate the total revenue reduction because of uncertainty regarding the future status of the excise tax, potential additional construction resulting from the concepts, and the future demand for ethanol. We also did not try to estimate the market value of the CCC grain that would be given to ethanol producers/developers even though the grain could potentially constitute an additional cost to the federal government.

Using surplus federal grain to expand the fuel ethanol industry would also have broader impacts beyond the ethanol industry. For example, there would likely be negative as

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well as positive economic consequences for farmers, oil companies, and consumers. Further, there may be national security, environmental, and foreign trade implications to these concepts.

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We discussed the report's contents with cognizant program officials at the Departments of Agriculture and Energy. These officials had clarifying and editorial comments but did not have any substantive problems with the report. These comments have been incorporated where appropriate. As agreed with your office, we did not obtain official agency comments on this report.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time, we will send copies to the Secretaries of Agriculture and Energy, to the producers/developers and lenders who participated in this study, and to other interested parties upon request. If you have any questions about the report, please call me on (202) 275-8545.

Major contributors to this briefing report are listed in appendix III.

Sincerely yours,

Flora H. Milans

Flora H. Milans
Associate Director

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ABBREVIATIONS

ASCS	Agricultural Stabilization and Conservation Service
CCC	Commodity Credit Corporation
DOE	Department of Energy
DDGS	Distillers dried grain and solubles
EPA	Environmental Protection Agency
ERS	Economic Research Service
FmHA	Farmers Home Administration
FOR	Farmers Owned Reserve Program
GAO	General Accounting Office
MTBE	Methyl tertiary butyl ether
PIK	payment-in-kind
USDA	United States Department of Agriculture

SECTION 1

OBJECTIVES, SCOPE, AND METHODOLOGY

OBJECTIVES

Declining world markets, federal farm programs, and the abundant grain harvests of recent years have helped to greatly increase the amount of surplus grain owned by the Commodity Credit Corporation (CCC). As requested in October 1985 by Senators J. James Exon and the late Edward Zorinsky and as further agreed with their offices, we were asked to study the feasibility of using this federally owned surplus grain by allowing ethanol producers to (1) pledge the surplus grain as collateral to secure financing for construction of ethanol plants (grain-as-collateral) and (2) use the grain free of charge as a feedstock with the hope that this subsidy would induce lenders to finance plant construction (grain-feedstock-as-inducement). These concepts, which have been discussed with industry and financial representatives as a means to expand the industry, are explained briefly below.

Grain-as-collateral: Under this concept, ethanol producers would initially pledge the grain as loan collateral to finance the new or expanded facilities. Producers would reserve the right to use the grain as fuel ethanol feedstock in the new facility when--under terms of the loan agreement--the lender released the grain.

Grain-feedstock-as-inducement: Under this concept, ethanol producers would receive the grain for eventual use as ethanol feedstock in the new facility. The project would not use the grain as collateral but would instead try to induce lenders to finance construction or expansion by showing that it had a commitment for free feedstock once the facility opened.

SCOPE

Most ethanol is made from grain, primarily corn. In evaluating the feasibility of using CCC-owned grain to develop the ethanol industry, we concentrated on ethanol producers who use grain, but we also interviewed some producers who make ethanol from other substances (such as cheese whey and waste materials).

Information was collected on the fuel ethanol industry from the Renewable Fuels Association and Information Resources, Incorporated--industry associations located in Washington, D.C.--and from fuel ethanol producers. To identify all ethanol producers in the United States, we used information provided by industry associations; the United States Department of Agriculture's (USDA) Office of Energy and Farmers Home Administration (FMHA); the Department of Treasury's Bureau of Alcohol, Tobacco, and Firearms;

Table 1.1: Ethanol Producers/Developers Included in Our Study

ADC-I, Ltd.
Hastings, Nebraska

A. E. Staley Manufacturing Company
Decatur, Illinois

Archer Daniels Midland Company
Decatur, Illinois

CEPO, Inc.
Batavia, Illinois

Ecological Energy, Inc.
Roca, Nebraska

Greater Rockford Energy & Technology Corp.
Rockford, Illinois

Kraft, Inc.
Glenview, Illinois

Mankato Ethanol Corp.
Minneapolis, Minnesota

Minnesota Corn Processors
Marshall, Minnesota

New Energy Company of Indiana
South Bend, Indiana

Pekin Energy Company
Pekin, Illinois

Phillips Equipment Company
Golden Valley, Minnesota

Renewable Energy, Inc.
Southfield, Michigan

Stroda Alcohol, Inc.
Fairfield, Nebraska

Table 1.2: Ethanol Lenders Included in Our Study

Bankers Trust Company
New York, New York

Bank for Cooperatives
St. Paul, Minnesota

Bank of New England
Boston, Massachusetts

E.F. Hutton & Company, Inc.
New York, New York

First Chicago
Chicago, Illinois

First National Bank and Trust
Rockford, Illinois

National Bank of Detroit
Detroit, Michigan

Northwest Banks
Minneapolis, Minnesota

U.S. Multitrade Company
Washington, D.C.

state agriculture and energy offices in Iowa and Minnesota; and the Great Lakes Regional Biomass Program directory.¹ As table 1.1 shows, 14 producers/developers were included in our study.

Construction of an ethanol plant is a costly venture, requiring substantial capital investment and generally involving large lending institutions. To identify financing sources for the fuel ethanol industry, we contacted the American Banking Association, FmHA, the Department of Energy's (DOE) Office of Alcohol Fuels, and the Nebraska Gasohol Committee. As table 1.2 shows, we selected nine lenders--primarily large urban banks--and interviewed the officials who participated in financing ethanol plants.

Information concerning earlier federal ethanol grain and loan guarantee programs conducted by DOE and USDA was reviewed, but we did not evaluate the effectiveness of these programs or their impact on the fuel ethanol industry.

With the concurrence of the requesters' office, we did not assess the impact that ethanol imports or the creation of a strategic ethanol reserve would have on the development of the U.S. ethanol industry. The Food Security Act of 1985/directed USDA to study these issues.

This study does not present a comprehensive cost-benefit analysis of using grain-as-collateral or grain-feedstock-as-inducement for assisting the ethanol industry. For example, although the grain provided by the CCC for such a program is considered surplus, this does not indicate that the grain has no value. Determining the value of this grain is beyond the scope of this report, but we recognize that it should be included in any calculation of total program costs. Our estimate of federal government costs, therefore, is conservative in that it does not take into account the value of this grain. Further, possible national security, environmental, or trade deficit effects associated with an expanding ethanol industry are not included. The study does, however, discuss possible economic consequences of these ideas, as mentioned by industry officials we interviewed.

METHODOLOGY

To determine whether these ideas were feasible and reasonable, we (1) assessed the availability of surplus federal grain, (2)

¹The directory includes a listing of all biomass (i.e., plant and animal waste material used for fuel) activities including ethanol production and related programs in the states of Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin.

evaluated the willingness of ethanol producers/developers² and lenders to become involved in federal efforts to assist the ethanol industry, and (3) examined the legal and administrative requirements that would apply to such a concept. We also considered possible grain storage cost savings and the two concepts' ability to further the development of the industry.

To determine how much federally owned grain was currently available, we relied on reports prepared by USDA's Agricultural Stabilization and Conservation Service (ASCS). We obtained projections for future CCC grain supplies from USDA's Economic Research Service (ERS).

A case study approach was selected because it allowed us to collect detailed information about factors that producers and lenders of new ethanol facilities might consider in their decision to fund such projects. We also were able, using this approach, to discuss in-depth with industry officials and lenders their reasons for taking part or not taking part in these two financing concepts. The fuel ethanol industry includes producers of diverse size (family-operated plants as well as large corporate facilities) who use a variety of techniques or processes to make ethanol. In selecting a cross-section of ethanol producers/developers to interview for our case studies, we considered the size and geographic location of the ethanol plant; the feedstock used; whether the plant used a wet or dry milling process (discussed in app. I), and whether the plant had any previous involvement with federal support programs.

We selected 11 producers and 3 developers (potential producers with specific plans for constructing ethanol production facilities) and questioned both groups about the feasibility of using grain-as-collateral and grain-feedstock-as-inducement concepts. The 11 active producers operated a total of 15 plants, with production capacity ranging from 200,000 to 150 million gallons of ethanol per year, and included a mix of plants using the wet and dry grain milling processes, as well as plants that did not use grain to make ethanol. Together, these plants represent almost 70 percent of the fuel ethanol industry's 1 billion gallon production capacity.

In selecting lenders to interview, we considered those institutions/organizations that had previously participated in financing ethanol facilities, including several lenders who were involved in projects financed in part with federally guaranteed loans. Institutions that have previously participated in the financing of ethanol facilities have generally been large regional

²Producers represent those businesses that currently convert grain or other raw materials into ethanol. Developers represent those with plans to build new ethanol facilities or add to existing ones.

or national lenders or investment banking firms. The lenders included in our analysis, therefore, were primarily these larger institutions. However, we also included lenders that provided financing on a local level or provided funds for specialized groups, such as farm cooperatives.

To collect comparable information for each of our case studies, we asked the ethanol producers/developers and lenders about the two grain-for-ethanol financing concepts as they might apply to actual or hypothetical plans for constructing additional fuel ethanol plant facilities. Our discussions with lenders involved sensitive matters, since we were asking about their willingness to commit funds to a theoretical ethanol project using unconventional funding concepts. To assure that we properly categorized the lenders' responses on these concepts, a follow-up letter was sent to all nine lending institutions. The letter asked them whether the grain-as-collateral and grain-feedstock-as-inducement concepts were feasible and whether they would be willing to participate in such funding arrangements. We also asked industry officials and lenders their opinions on the importance of federal incentives and support to the current and future health of the ethanol industry.

With USDA's Office of General Counsel, we discussed possible legal impediments to using federally owned grain to help develop the fuel ethanol industry. We discussed possible administrative and policy impediments with ASCS's Commodity Management Operations officials.

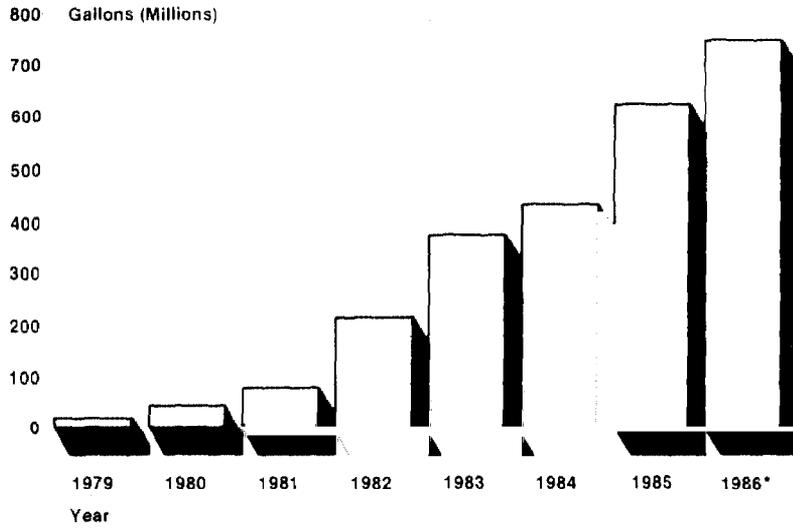
Our review was conducted between January and December 1986 in accordance with generally accepted government auditing standards.

SECTION 2

INTRODUCTION

- o The fuel ethanol industry grew steadily during the early 1980s, but changing market conditions now cloud the industry's future.
- o The federal government has taken an active role in the growth and development of the fuel ethanol industry.
- o State government incentives have also been important in the development of the fuel ethanol industry and in the marketing of fuel ethanol.
- o Current inventories of surplus grain total about 2.7 billion bushels and are expected to remain high, at least through 1987.

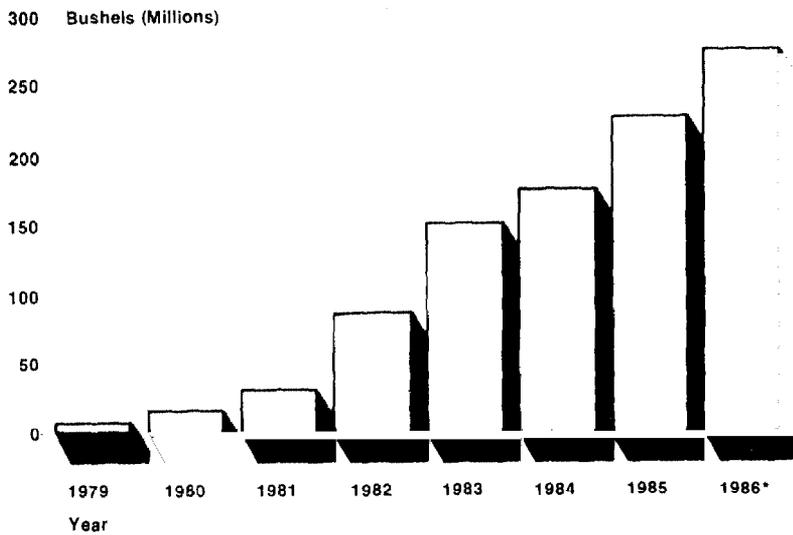
Figure 2.1: U.S. Fuel Ethanol Production (1979-86)



* Projected

Source: Information Resources Incorporated, Wash., D.C.

Figure 2.2: Grain Use for U.S. Fuel Ethanol Production (1979-86)



* Projected

Source: Information Resources Incorporated, Wash., D.C.

THE FUEL ETHANOL INDUSTRY

The nation's ethanol industry emerged during the oil market turbulence of the 1970s. A blend of 10 percent ethanol with 90 percent gasoline, sometimes called "gasohol," was used as a means to extend U.S. gasoline supplies. With the aid of federal and state incentives to produce alcohol fuels like ethanol from renewable resources, and EPA's orders in 1982 and 1985 to further reduce the allowable levels of lead in gasoline, the industry expanded rapidly, growing from an annual production of 20 million gallons in 1979 to 750 million gallons in 1986, as shown in figure 2.1. Sixty-four fuel ethanol facilities currently operate in the United States, with a combined annual production capacity of almost 1 billion gallons. However, the recent decline in ethanol prices, competition from other gasoline octane-enhancing additives, uncertain prospects for continued governmental incentives, and the effect of this uncertainty on fuel ethanol market prices have dampened the industry's expansion and raised questions about its future.

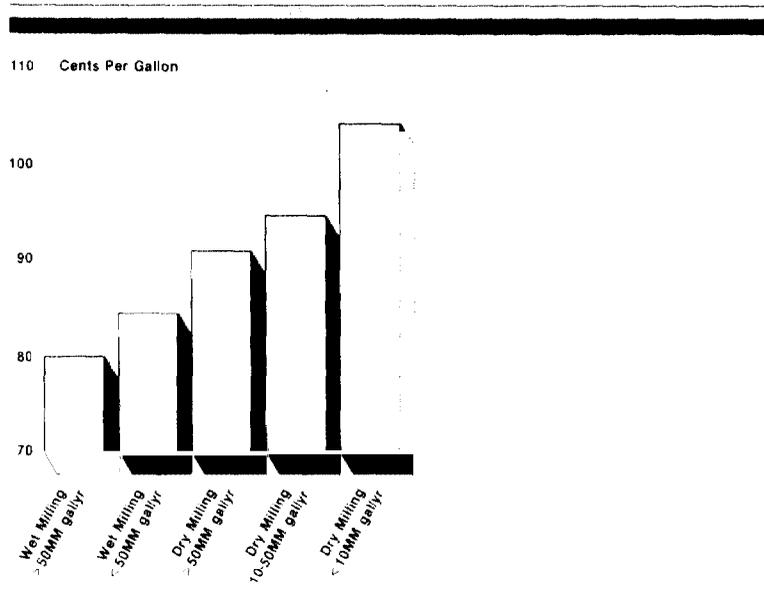
Ethanol production

Ethanol can be produced using almost any raw material containing sugar or carbohydrates. In the United States, however, about 84 percent of fuel ethanol is made from corn. About 6 percent is made from other grains--such as wheat, sorghum (milo), and barley--and the rest is made from sugar products, potatoes, cheese whey, waste materials, and other miscellaneous feedstocks. As shown in figure 2.2, in 1986 almost 300 million bushels of grain were used in the production of fuel ethanol.

Corn is converted to fuel ethanol through either the wet or the dry milling process. (See app. I for further discussion of wet and dry milling processes.) Wet milling accounts for most of the fuel ethanol produced in this country although operating dry milling facilities greatly outnumber those using the wet milling process. The fuel ethanol industry evolved out of the corn processing industry, as ethanol facilities complement the corn processors' corn sweetener operations--they can use some processing facilities for either corn sweetener or ethanol production.

The revenues fuel ethanol producers receive from the sale of production by-products and co-products--distillers dry grains, wet grain feeds and corn oil--are essential to profitable operations, according to producers we talked with and a USDA analysis of 1985 ethanol feedstock costs. Further growth of the ethanol industry will therefore be influenced by the marketability of fuel ethanol, the feed grain by-products, and corn sweetener.

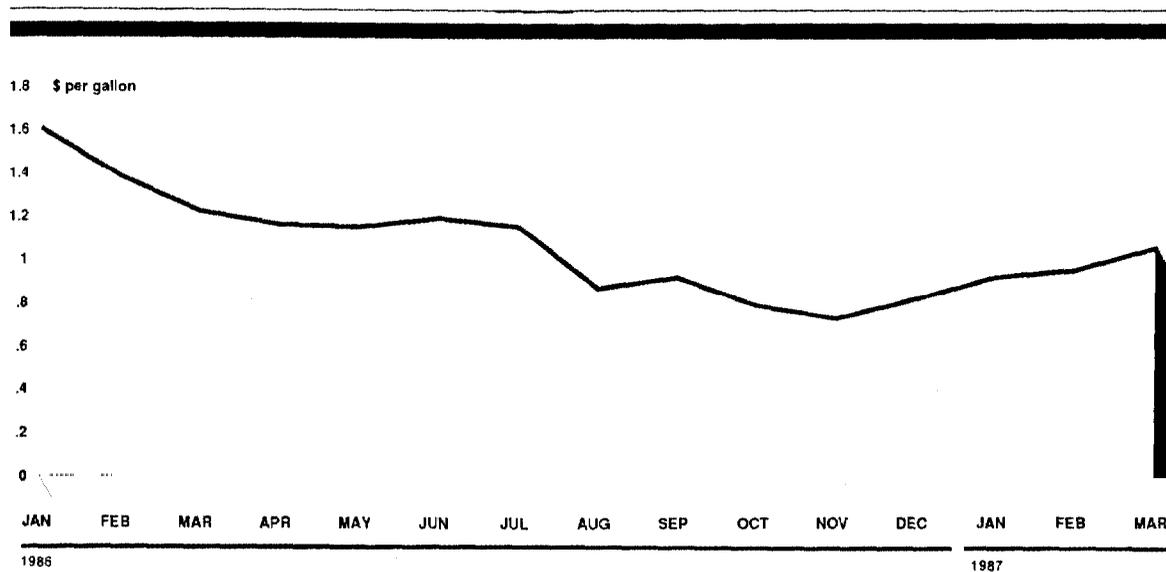
Figure 2.3: Ethanol Production Operating Cost by Plant Type and Size (1986)^a



^a Operating Costs Do Not Include Depreciation, Loan Service or Debt Repayment Costs

Source: U.S. Octane Outlook

Figure 2.4: Ethanol Prices (1986)



Source: Information Resources, Incorporated, Wash., D.C.

There are economies of scale in ethanol production. The larger ethanol plants are generally more cost-efficient than the smaller plants. Further, wet milling plants usually have lower net operating costs than the dry milling plants. Figure 2.3 illustrates the differences in production costs for wet and dry milling plants of varying sizes. Wet milling plants generally achieve lower operating costs because (1) some of the process facilities are shared with corn sweetener operations, and (2) ethanol can be produced using excess sweetener capacity in winter months when the demand for sweetener in soft drinks is low. In addition, revenues of wet milling plants are higher because the feed by-products have a higher market value than those from dry milling plants.

The cost of grain used as feedstock to make fuel ethanol can represent 40 to 80 percent of ethanol production costs, according to industry sources. Therefore, the commodity market price of the grains used for ethanol (corn, wheat, etc.) has a significant influence on fuel ethanol producers' overall profitability.

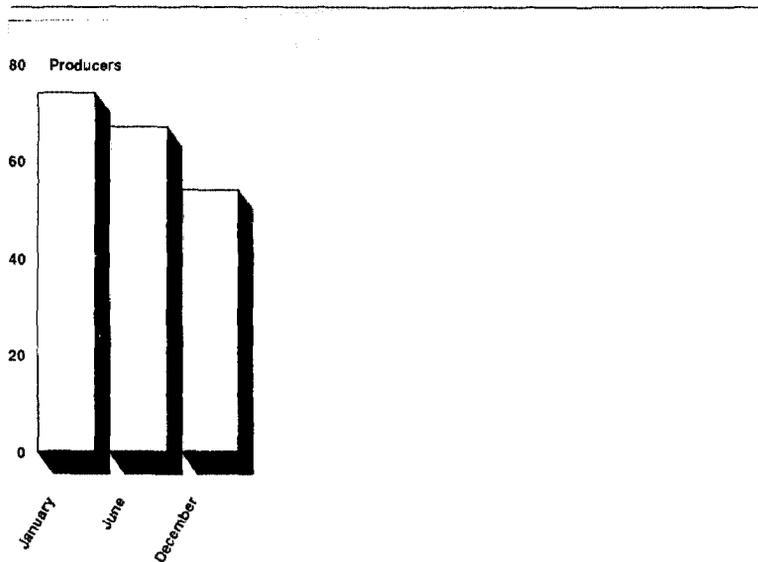
The ethanol industry is experiencing difficulties

In 1986, economic uncertainty and change characterized the fuel ethanol industry, and many ethanol producers found it difficult to operate profitably. Although declining grain feedstock prices helped reduce the average operating costs of ethanol producers, these cost reductions were offset by sharp declines in ethanol prices. Falling oil prices reduced the price of petroleum-based octane additives, making them more price competitive with ethanol as a gasoline additive. Publicity regarding ethanol's usefulness as an octane additive appears to have also influenced the demand for ethanol.

Falling ethanol prices influenced by oil price declines

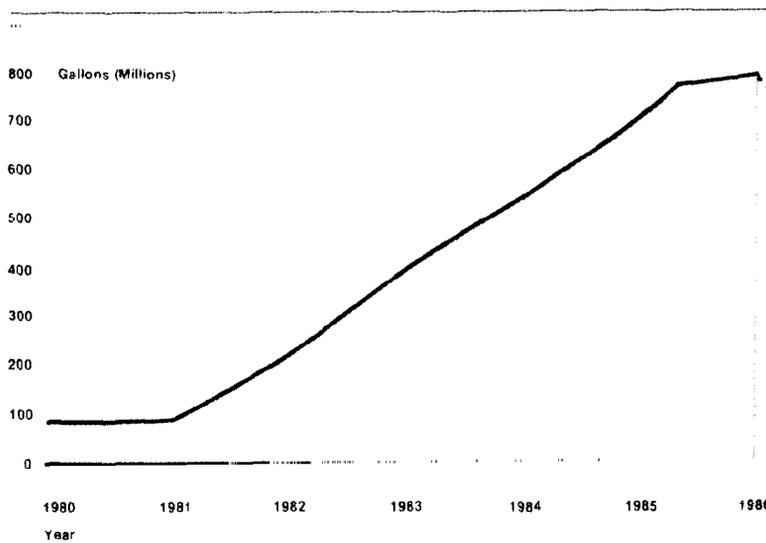
The market price of fuel ethanol dropped sharply in 1986 (see fig. 2.4), hurting ethanol plant profitability, discouraging capacity expansion, and forcing plants to close. Worldwide oil prices fell from about \$30 per barrel in November 1985 to about \$10 per barrel by July 1986. During this period, average U.S. wholesale terminal gasoline prices dropped nearly 50 percent. As gasoline prices fell, so did the price of ethanol. Fuel ethanol prices, which averaged about \$1.60 per gallon in January 1986, fell to \$0.73 per gallon by December, about a 54 percent decline. As of March 1987, ethanol prices were averaging about \$1.05 per gallon.

Figure 2.5: Number of Ethanol Producers in Operation, 1986



Source: Information Resources, Incorporated, Wash., D.C.

Figure 2.6: U.S. Fuel Ethanol Sales



Source: Information Resources Incorporated, Wash., D.C.

With ethanol prices down, producers have found it difficult to make a profit in today's economic environment. The ethanol producers we visited told us how difficult it was to operate at a profit with current market conditions. For example, they told us their revenues from fuel ethanol and by-product sales did not always cover production costs, plant financing, and depreciation expenses. One industry source estimated that when fuel ethanol prices dropped to about \$0.90 per gallon, about one-third of the industry's plant capacity is not operating profitably.

The decline in fuel ethanol prices and the leveling off of demand have also discouraged the expansion of ethanol production capacity, and the steady industrywide growth of the early and mid-1980s has flattened. One producer told us his company shelved an expansion project in 1985 when oil prices fell below \$24 per barrel. Another said he had scaled back a proposed production expansion project to one-third of its originally planned size because of the drop in ethanol prices.

Finally, the decline in fuel ethanol prices and its effect on plant profitability has forced many plants to close, as shown in figure 2.5. At the beginning of 1986 there were 74 operating fuel ethanol plants in the United States, but by December this number had dropped to 54.¹ Many of the plants that ceased operation were small ethanol producers and were more vulnerable to changing market conditions. In April 1987, New Energy Company of Indiana, which had the largest guaranteed loan under DOE's Ethanol Loan Guarantee Program, defaulted on its loan of about \$127 million. DOE paid off the New Energy loan and is currently the sole creditor for this plant. According to ethanol producers we visited, the 1986 USDA ethanol certificate program, which compensated producers for ethanol feedstock expenses, was extremely useful in helping producers meet costs. (See app. II for more information on this and other ethanol programs.) Nonetheless, it did not prevent the shutdown of some plants.

Demand for fuel ethanol decreasing

The market demand for fuel ethanol, as shown by ethanol sales in figure 2.6, increased substantially from 1982 through 1985, but remained almost constant during 1986 compared with the previous year. Competition from petroleum-based additives, which have decreased in cost as oil prices have fallen, has influenced

¹Even though a number of ethanol plants discontinued operation during 1986, industrywide production capacity increased slightly because a few of the larger producers added to or expanded their facilities.

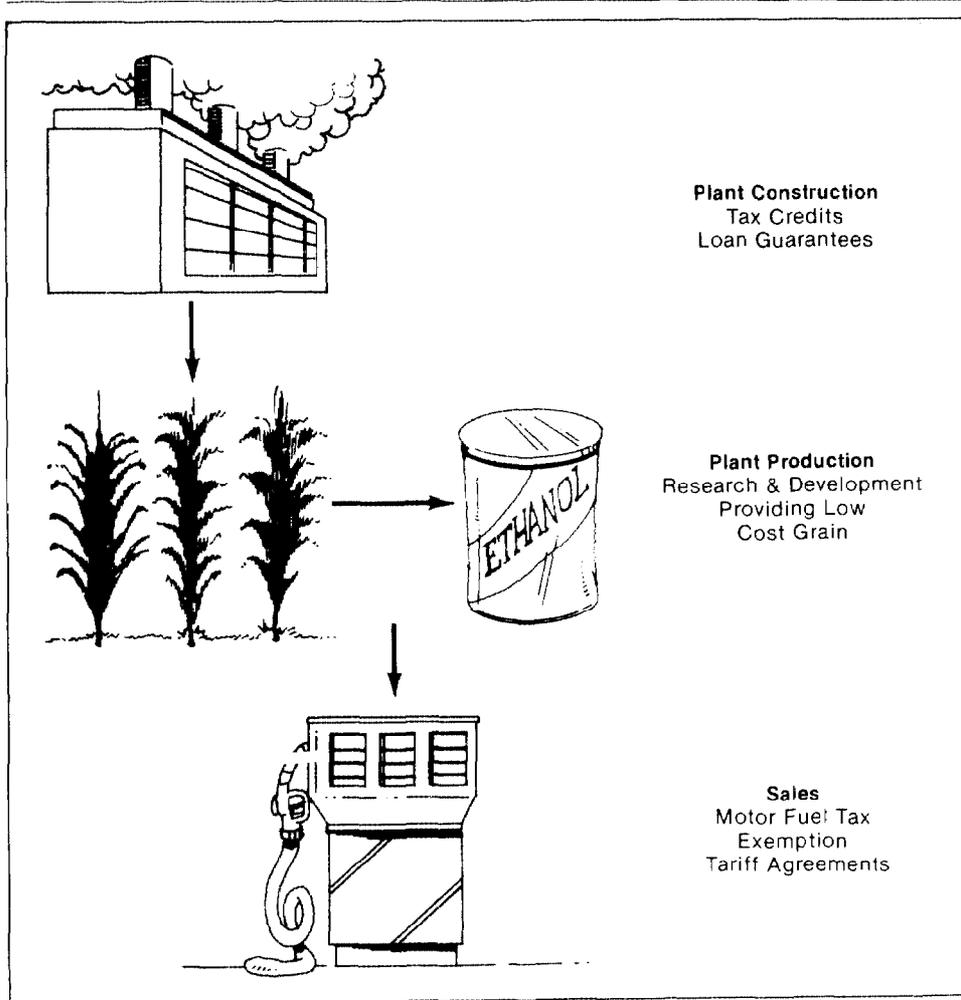
ethanol demand. Further, according to ethanol producers, ethanol's acceptance as an ingredient to be blended with gasoline has been hurt by unfavorable, and sometimes misleading, publicity. While the ethanol industry has initiated efforts to improve the public image of fuel ethanol, other gasoline additives are competing with ethanol as octane enhancers.

Ethanol's market demand is influenced, to a large extent, by oil prices and competition from other gasoline octane additives. When oil prices dropped, according to industry officials, the profit margin of gasoline distributors, in the short run, increased. This increased profit margin occurred because there is a period of time when distributors can purchase lower-priced gasoline, reflecting falling world oil prices, but still sell the gasoline for higher retail prices that have not been adjusted for these market changes. With higher profit margins, distributors have more flexibility to select octane-enhancing additives that still allow them to make a profit. In some instances, distributors may be willing to pay marginally higher prices for petroleum-based additives if they can be used more conveniently. For example, while ethanol-blended gasoline has the advantage of an excise tax exemption, it can be more inconvenient to handle than petroleum-based additives. Since ethanol mixes readily with water, it is generally transported by truck in order to prevent contamination by water in pipelines. Petroleum-based additives, on the other hand, do not mix with water and can be shipped by pipeline at a lower cost. Although ethanol is an effective substitute for lead as a gasoline octane enhancer, the strong competition it faces from petroleum-based octane additives such as toluene, benzene and MTBE (methyl tertiary butyl ether), further weakens the demand for fuel ethanol.

According to ethanol producers, in addition to strong competition from other octane additives, the demand for ethanol/gasoline blends has also been influenced by publicity adversely affecting ethanol's image. Although ethanol has been used for several years, it receives mixed reactions from the public. Ethanol fuel sales tend to be highly regional, with the majority of ethanol blend sales concentrated in the midwestern states. In certain markets, ethanol/gasoline blends account for nearly half of all gasoline sales.

Ethanol producers cite some oil companies' advertising campaigns that promote their gasoline as containing "no alcohol" as a reason for uncertainty about ethanol's usefulness. One major oil company reported that its customers rated ethanol-blend driveability lower than that of pure gasoline, especially in very hot or cold weather. However, tests conducted by another major oil

Figure 2.7: Federal Government Support for the Fuel Ethanol Industry



company showed no special problems for ethanol fuel under extreme weather conditions. Ethanol producers also object to some automobile warranty materials. One producer noted that while every car manufacturer that sells cars in the United States honors its warranties for cars using an ethanol/gasoline fuel blend (using 10 percent ethanol), many of the warranty documents give confusing or misleading information about the acceptability of ethanol-blended fuel.

Ethanol industry representatives told us that the public's perception of ethanol/gasoline blends also appears to be influenced by

- widely published articles by automobile columnists and feature writers criticizing ethanol or confusing it with problems attributable to other alcohol fuels, such as methanol; and
- auto service personnel and dealers who, according to ethanol producers, give incorrect information about ethanol and its effect on car operations.

Recognizing these as serious problems, ethanol proponents, such as grain producer organizations and state farm bureaus, have initiated efforts to bolster ethanol's image as a fuel additive. These efforts include, for example, newspaper and radio advertising, discussions to persuade oil companies to cease their "no alcohol" advertising, and special promotions to get consumers to use gasohol. An industry newsletter reported on several promotional efforts by ethanol producers. One major ethanol producer used advertisements in automotive and service station magazines to explain ethanol's role as an octane enhancer and to point out that it has no noticeable effect on driveability. Another ethanol producer in North Dakota sponsored an ethanol/gasoline blend giveaway that provided 10 free gallons to the first 200 cars that drove in.

GOVERNMENT SUPPORT OF THE ETHANOL INDUSTRY

While most fuel ethanol plants have been built with private capital, the federal government played a significant role in expanding the industry by providing research and development funds, direct construction loans, loan guarantees, tax credits, and motor fuel tax exemptions (see fig. 2.7). According to industry officials and lenders we dealt with during this review, federal and state incentives were essential to the steady growth of the fuel ethanol industry in the early 1980s.

Federal incentives

Since 1978, the federal government has provided a variety of financial incentives to promote the development of alcohol fuels and the domestic ethanol industry. In 1984 we issued a report, Importance and Impacts of Federal Alcohol Fuel Tax Incentives (GAO/RCED-84-1, June 6, 1984), which discussed these incentives, their importance to the ethanol industry, and their effects on the U.S. economy, international trade, and national security. The relevant laws are briefly discussed here. A more extensive discussion of government programs relating to the ethanol industry is included in appendix II.

- The Energy Tax Act of 1978 (Public Law 95-618) exempted fuels containing at least 10 percent ethanol from the federal gasoline excise tax on motor fuels. It also provided a 10 percent energy investment tax credit on equipment purchased to produce ethanol. Both provisions were contingent on producing the ethanol from renewable resources.
- The Crude Oil Windfall Profit Tax of 1980 (Public Law 96-223) extended the energy investment tax credits and the gasoline excise tax through 1985 and 1992, respectively, and gave ethanol blenders an income tax credit.
- The Omnibus Reconciliation Act of 1980 (Public Law 96-499) imposed special duties on fuel ethanol imports equivalent to the federal gasoline excise tax exemption so that ethanol importers do not benefit from the tax exemption.
- The Energy Security Act (1980) (Public Law 96-294) authorized guarantee funding to build ethanol plants. It also established the Office of Alcohol Fuels in the Department of Energy to administer provisions of the law.
- The 1980 amendment to the Consolidated Farm and Rural Development Act (Public Law 96-438) authorized the FmHA to guarantee loans for alcohol production facilities under the Business and Industry Loan Program.
- The Surplus Agricultural Commodities Disposal Act of 1982 (Public Law 97-358) granted the Secretary of Agriculture discretionary authority to use surplus CCC stocks for conversion into fuel ethanol.
- The Food Security Act of 1985 (Public Law 99-198) provided the Secretary of Agriculture with the authority to make federally owned commodities available free, or at reduced cost, for the production of liquid fuels.

According to industry officials and lenders, these federal incentives have been largely responsible for the development of the fuel ethanol industry. However, in recent years the federal government's alcohol fuels policy has undergone several dramatic shifts. For example, in early 1981, the administration announced that it intended to adopt market principles to achieve national energy goals. As part of this strategy, the administration proposed rescinding the Energy Security Act's loan guarantee authority for alcohol fuels. These loan guarantee programs were to encourage construction of fuel ethanol facilities. In addition, an early repeal of the gasoline excise tax exemption was proposed in the President's fiscal year 1987 and 1988 budgets.

While most of these key provisions remained intact, there is considerable uncertainty among the producers/developers and lenders we visited regarding the federal government's long-term commitment to ethanol as an alternative fuel. An industry expert said, that while it is preferable that the ethanol industry wean itself from government support, given today's economic situation, government incentives of some type will be required. The excise tax exemption and blender tax credit are scheduled, under existing legislation, to expire in 1992.

Gasoline tax exemptions

The cornerstone of government ethanol incentives is still the federal and state gasoline tax exemptions. According to government and industry representatives, much of the development of the domestic fuel ethanol industry and the uses of ethanol in gasoline have depended on these incentives. Without these tax incentives, ethanol producers would have difficulty marketing their product or attracting the equity capital and financing necessary for start-up operations.

The federal government currently exempts gasoline from 6 cents of the 9-cent federal excise tax if it is blended with at least 10 percent ethanol produced from renewable resources. The 6-cent per-gallon motor fuel tax exemption equates to a 60-cent per-gallon subsidy on each gallon of fuel ethanol blended with gasoline. Each gallon of ethanol can be blended with 9 gallons of gasoline when used on a 10 percent ethanol/90 percent gasoline basis. One lender we spoke with during our review said that the length of financing terms offered to ethanol producers/developers was tied to the 1992 scheduled expiration date of the 6-cent federal motor fuel tax exemption.

Table 2.1: State Tax Exemptions On Gasoline/Ethanol Blends
as of July 1, 1986

<u>State</u>	<u>Existing fuel tax</u>	<u>Ethanol blend exemption^a</u>	<u>Comments</u>
	(cents)	(cents)	
Alabama	11.0	3.0	
Alaska	8.0	8.0	
Connecticut	14.0	1.0	
Florida	4.0	2.0	
Hawaii	11.0	(b)	exemption calculated as 4 percent of retail sale
Idaho	14.5	4.0	
Illinois	13.0	(b)	exemption calculated as 2 percent of retail sale
Iowa	16.0	1.0	
Kansas	11.0	3.0	drops to 2 cents in 1987
Kentucky	15.0	(c)	tax credits: \$.35/gallon in-state, \$.25/gallon other
Louisiana	16.0	16.0	replaced with a \$1.40 per gallon producer subsidy in September 1986
Maine	14.0	4.0	drops to 3 cents in 1987
Minnesota	17.0	(c)	tax credit: \$.25/gallon
Mississippi	9.0	(b)	exemption calculated as 6 percent of retail sale
Montana	15.0	(c)	tax credit: \$.30/gallon
Nebraska	19.0	3.0	
Nevada	11.25	1.0	
New Jersey	8.0	8.0	
New Mexico	11.0	11.0	
North Dakota	13.0	8.0	
Ohio	12.0	2.5	
South Carolina	13.0	6.0	in-state ethanol only
South Dakota	13.0	3.0	
Tennessee	17.0	4.0	
Texas	10.0	5.0	lower for out-of-state ethanol
Utah	14.0	(c)	tax credit: \$.30 per gallon
Washington	18.0	2.8	

^aBy exemption we mean that the producers/distributors do not pay state tax on this amount. For example, Alabama's fuel tax on gasoline is 11 cents per gallon. If the gasoline is blended with ethanol, an 8-cent per-gallon tax would be charged.

^bState exemptions on retail sales tax.

^cState provides a tax credit on each gallon of ethanol that is blended with gasoline. Ten percent of the ethanol production credit would apply to each gallon of blended fuel.

Other federal assistance

In addition to these government incentives, USDA has attempted to support the ethanol industry directly by using its surplus grain to make ethanol. For example, in 1982 USDA's ethanol demonstration program provided low quality grain to ethanol producers,² who were to keep the proceeds from by-product sales and give the proceeds from ethanol sales to the CCC. In 1986, CCC designed an ethanol certificate program³ to encourage the use of grain in the production of fuel ethanol and to help the financially strapped fuel ethanol industry. Under this program fuel ethanol producers who bought grain in commercial markets and converted it to fuel ethanol were issued certificates that they could exchange for CCC corn, wheat, or other commodities. The authority for the certificate program came from the Food Security Act of 1985, which allows CCC to provide its commodity stocks free, or at a reduced cost, to encourage production of alcohol fuels.

State incentives

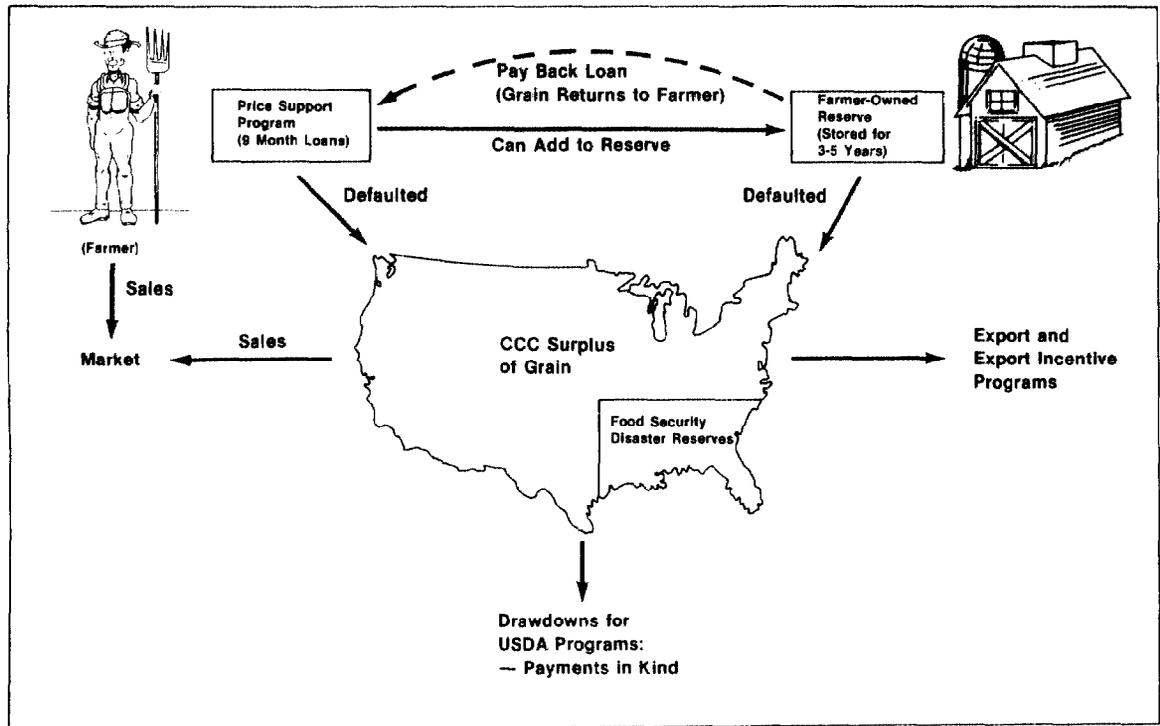
State government incentives have also been an important factor in the development of the fuel ethanol industry and in the marketing of fuel ethanol. As shown in table 2.1, ethanol/gasoline blends are exempt from part or all of the taxes on motor fuels in 27 states (in addition to the federal tax exemption), and industry experts told us that these state exemptions are important considerations in determining where ethanol/gasoline blends are marketed. State motor fuel tax exemptions can add another \$.10 to \$1.10 per gallon of ethanol to the \$.60 per gallon federal exemption. Some states such as Virginia and California, among others, provide incentives in the form of direct payments to producers. The importance of these state exemptions can be seen when comparing ethanol sales in states with the exemption to those without it. Sales of ethanol/gasoline blends are generally lower in markets where ethanol has no state incentives. However, sales have climbed rapidly in those states where tax exemption incentives were instituted.

Other examples of state efforts to encourage the development and use of fuel ethanol include:

²According to producers we interviewed, the dry corn milling process can use low quality (i.e., deteriorating) corn.

³The program was entitled, The Temporary Program to Encourage Use of Grain For Fuel Ethanol.

Figure 2.8: Grain Cycle - How CCC Accumulates and Disposes of Grain Surplus



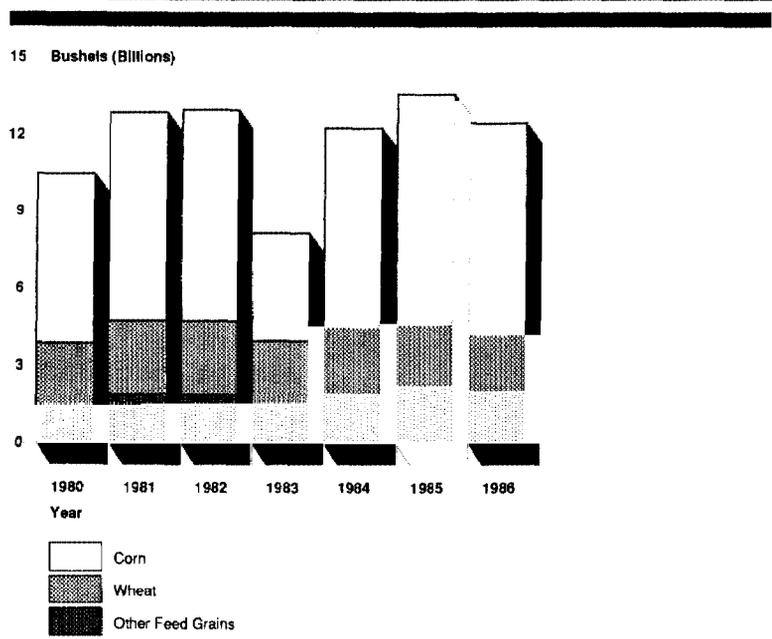
- Minnesota's program, which provides state resource development loans and loan insurance to ethanol producers;
- Nebraska's program, which uses funds obtained from a special grain surcharge to provide communities with capital grants for the construction of ethanol plants; and
- Indiana's plan, as approved by DOE, to use oil company overcharge refunds to help provide a direct producers' subsidy.

SURPLUS GRAIN

In recent years, the supply of U.S. grain has increased significantly. Grain farmers have had large harvests, while at the same time demand has weakened, partly because of decreasing export markets. The growth of CCC-owned grain inventories in recent years can be attributed in part to federal farm programs and market conditions for grain. The federal government operates a number of programs to support the prices of agricultural products and the incomes of those who produce them. Through these programs, the federal government attempts to stabilize farm commodity supplies, keep commodity prices stable and reasonable, and increase farm income. Some of these programs may result in federal acquisition of grain.

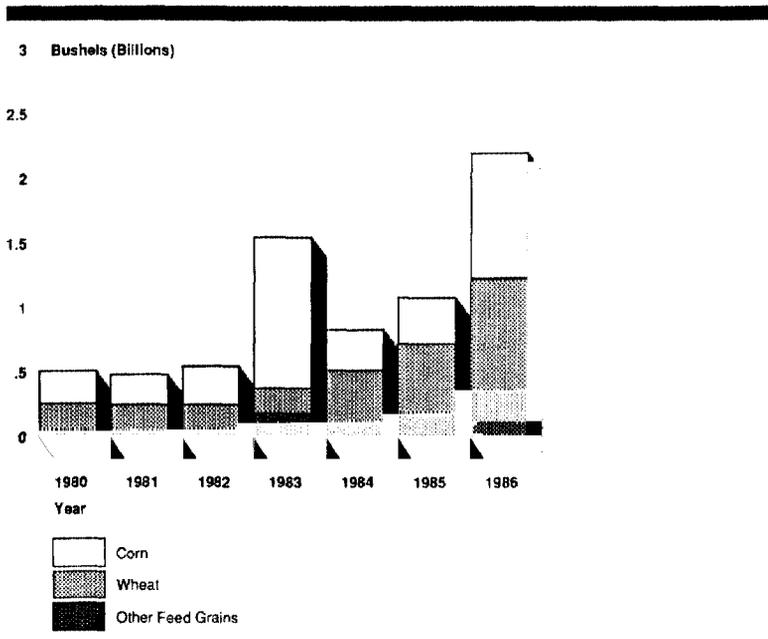
The cycle of how federal loans for farming commodities and storage programs can contribute to the accumulated grain surplus is illustrated in figure 2.8. When farmers harvest their crops, they can sell their grain in the market or store it for sale later. If farmers decide to store grain, they can use the grain as collateral in applying for 9-month CCC loans. Farmers can redeem the grain collateral at any time by paying off the loans, plus interest, and they can then sell the grain at the current market price. If the grain's market value does not reach a profitable level during the 9-month period, farmers may default on loans and forfeit the grain to the CCC. This grain is then added to the CCC surplus. During recent years, many farmers have found it advantageous to default on their government loans, forfeiting the grain to the CCC, and receiving price support payments that are more than the prevailing market price. If farmers do not want to forfeit their grain, CCC's Farmer Owned Reserve program (FOR) offers an alternative. Under this program, farmers commit their grain to remain in storage for three years, unless the market price meets a predetermined level. In return, the CCC pays the farmer for grain storage and waives part of the farmer's loan interest payments. If the farmer defaults at the end of the 3-year period, the loan debts are forgiven and the CCC acquires the grain.

Figure 2.9: U.S. Grain Production (1980-86)



Source: USDA

Figure 2.10: Grain Surplus Levels (1980-86)



Source: USDA

The CCC-owned grain can only be sold on the market at predetermined prices--that are currently above the prevailing market price--so as not to disrupt prices. In special circumstances CCC-owned grain can be given away or used in lieu of cash payments: as it was in the 1983 and 1986 payment-in-kind (PIK) programs or in the 1986 ethanol certificate program. The CCC-owned grain is also authorized for export and export-incentive programs. Some of the surplus grain is earmarked for food security and disaster reserves and would not be available for ethanol programs.

Current inventories of CCC-owned corn, wheat, and other feed grains total about 2.7 billion bushels. Figures 2.9 and 2.10 illustrate the changes in U.S. grain production and surplus federal grain inventories since 1980. Currently, these surplus grain inventories are taxing the CCC's ability to provide adequate grain storage. To cope with this grain storage problem, the CCC has authorized the use of temporary and emergency storage facilities. The CCC has approved emergency storage in rail cars, on barges, and on the ground to meet storage requirements. The cost to the federal government to store all surplus grain currently in inventory is almost \$860 million annually (see section 4 for more detail on associated government costs). While the CCC disposed of some surplus grain--primarily through the 1986 PIK and ethanol certificate programs--huge grain inventories remain. Furthermore, grain farmers are holding another 7.5 billion bushels of grain that are pledged as collateral for the CCC price support loans or are held in the FOR. If the market price of grain remains low, farmers may let the CCC acquire part or all of this grain, which would further increase surplus inventories. The ERS estimates that the amount of surplus grain is likely to remain high, at least through 1987.

CONCLUSIONS

Although the fuel ethanol industry grew steadily during the early 1980s, declining prices and weakened demand for fuel ethanol in 1986 threatened the economic viability of many ethanol producers. There were 10 fewer fuel ethanol plants operating at the end of 1986 than at the start of the year. Federal and state governments have played a significant role in expanding the industry and in determining how fuel ethanol is marketed, but recently the administration has sought the repeal of some programs, including the gasoline excise tax exemption given to industry. Federal programs to assist farmers contribute to current surplus grain inventories of almost 3 billion bushels and cost the federal government almost \$860 million annually to store. Although the CCC disposed of some surplus grain in 1986, large inventories are expected to remain.

SECTION 3

INDUSTRY VIEWS ON FINANCING CONCEPTS

- o The financing concepts explored for this report include using federally owned grain as (1) collateral to finance the construction of fuel ethanol plants and (2) a free ethanol feedstock supply to attract financing for fuel ethanol plants.
- o There was limited support among producers/developers and lenders for an expansion of the fuel ethanol industry at this time, regardless of the availability of surplus grain for collateral or feedstock purposes.
- o The concept of using surplus federal grain as collateral to help finance expansion of the ethanol industry has qualified support from producers/developers, but limited support among lenders.
- o The concept of committing surplus federal grain as fuel ethanol feedstock to help secure financing for new production facilities appeals to most producers/developers, and lenders were somewhat supportive of this approach.
- o Ethanol producers were generally more concerned about ways to use surplus grain to survive current economic conditions rather than to expand the industry.
- o Ethanol producers also suggested alternative ways of assisting the fuel ethanol industry.

Figure 3.1: Illustration of How Surplus Grain Might Be Used To Finance Ethanol Plant Construction/Expansion

<u>CASE 1</u>	<u>CASE 2</u>
<u>BUILD NEW ETHANOL PLANT</u>	<u>EXPAND EXISTING ETHANOL PLANT</u>
20 million gallons/year capacity using a dry corn milling process	20 million gallons/year capacity using a dry corn milling process
Construction cost per gallon is \$2.50	Construction cost per gallon is \$1.50
CCC corn eligibility: ^a	CCC corn eligibility: ^a
-- Amount: 24 million bushels	-- Amount: 24 million bushels
-- Value: ^b \$38.4 million	-- Value: ^b \$38.4 million
-- Storage cost: ^c \$7.5 million per year or \$22.5 million over 3 years.	-- Storage cost: ^c \$7.5 million per year or \$22.5 million over 3 years.
<u>Grain-as-Collateral:^d</u>	
Use corn valued at \$38 million as collateral to help finance new plants costing \$50 million.	Use corn valued at \$38 million as collateral to help finance a \$30 million expansion.
<u>Grain-Feedstock-as-Inducement:</u>	
Use a 3-year ethanol feedstock supply to induce financial backing for new plant.	Use a 3-year ethanol feedstock supply to induce financial backing for plant expansion.

^aA bushel of corn makes 2.5 gallons of ethanol. Therefore, a 3-year feedstock for a 20 million gallon ethanol plant would need 24 million bushels, or 8 million bushels per year.

^bUsing a GAO estimated corn price of \$1.60/bushel.

^cStorage costs are based on the average \$.31167/bushel rate the CCC paid for commercial storage as of April 1987.

^dThe value of the corn as collateral would probably not be equal to the market value, and other sources of financing may be necessary.

USING SURPLUS GRAIN TO SUPPORT
ETHANOL INDUSTRY EXPANSION

Surplus federal grain could be used in a variety of ways to support the fuel ethanol industry. We presented two specific concepts to producers/developers and lenders, illustrated in figure 3.1, for projects using surplus grain to develop additional fuel ethanol facilities. We have entitled them the grain-as-collateral and grain-feedstock-as-inducement concepts. We asked ethanol producers, developers, and lenders to comment on the idea of using federally owned grain to secure financing for ethanol plant construction. In discussing these specific financing concepts, we presented the following project assumptions:

- The project could be for either constructing a new fuel ethanol facility or expanding an existing plant.
- Qualified producers/developers would receive up to a 3-year supply of surplus grain for use only as feedstock in the new or expanded production facility.
- The amount of grain provided would be based on the designed operating capacity of the new facility and issued in the form of non-negotiable certificates.
- Title to the grain would pass to the producers. Therefore, all subsequent storage, handling, and transportation costs would be the responsibility of the producers, not the federal government.¹
- If the project were not completed as agreed, the title to the grain not committed as collateral would revert back to the federal government.²

To focus on the merits of each financing concept and to reduce lenders' apprehensions about commenting on theoretical ethanol projects, we asked the lenders to assume that the project's anticipated cash flow would be sufficient to meet expenses and provide a return to investors. We acknowledged that these assumptions probably would not apply to existing conditions or to specific proposals in view of the current market condition for

¹We assume this because it would benefit the federal government in terms of storage costs, which was an assumption in the request from Senator Exon.

²This assumption is consistent with the limitations set by law that the grain not be used except to produce ethanol and that it not displace other grain markets.

ethanol and ethanol prices. Views about these two concepts are discussed below.

INDUSTRY VIEWS ON GRAIN USE CONCEPTS

Ethanol industry officials generally believe that it is not economically feasible to expand ethanol production capacity in the near term until sufficient demand for fuel ethanol is generated and ethanol prices increase. We were told by producers and lenders alike that expansion of the industry is premature, with or without federal financing incentives.

Producers and lenders expressed reservations about a government program to expand the fuel ethanol industry because of current market conditions. About half of the producers we interviewed said expansion of the industry was not currently needed and that it would only make sense if combined with steps to increase the demand for fuel ethanol. According to these officials, expansion without a corresponding increase in market demand would probably worsen existing oversupply conditions. Lenders told us their primary concern with providing loan commitments for projects, such as the construction of an ethanol plant, was the project's ability to generate sufficient cash flow to meet expenses and provide a return on investment, not the strength of the loan collateral.

While considering an expansion of the industry at this time to be premature, ethanol producers we interviewed were generally optimistic about the long-term potential of the fuel ethanol industry. Producers said they believed the fuel ethanol industry has a viable future and that

- oil prices are likely to rise faster than grain prices, making ethanol a more attractive additive;
- as production becomes more efficient, fuel ethanol will be more attractive as a clean, lead-free gasoline octane component; and
- the market areas that have not yet been tapped can be developed.

Further, most of the smaller producers we interviewed (i.e., those producing under 40 million gallons annual capacity) had plans for future expansion or said they had considered expansion, indicating some confidence in the industry. The larger producers generally said they could expand if the economic conditions were favorable. Developers were also optimistic about industry growth and development, and, accordingly, some were continuing with plans for future production facilities.

Table 3.1: Industry Views on Grain-as-Collateral Concept

	<u>Number responding</u>	<u>Proposal is feasible</u>		<u>Would participate</u>	
		<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
Lenders	9	3	6	2	7
Producers/ developers	14	11	3	7	7

Ethanol lenders were more cautious in commenting on the industry's outlook, but several of these lenders remained involved with or were considering funding additional fuel ethanol plants. Projects being considered generally offer them some unique advantage--such as loan guarantees, favorable state subsidies, or exceptionally qualified project managers.

Comments on the grain-as-collateral concept

Using an assumption that projects initiated under the concepts would be profitable, most lenders, as shown in table 3.1, said that the grain-as-collateral concept is not feasible and that they would not participate in such a program. Three lenders told us that the concept is feasible. This total included one lender who said that the grain-as-collateral concept might provide the extra support needed to complete financing for a project he was considering.

The six lenders who did not think that grain-as-collateral would be feasible included two who said that some modified proposals might be feasible. One lender said that the 3-year supply ceiling in the proposal might be too restrictive and more grain might be needed. Another noted that the collateral concept might work if the grain's value were guaranteed and the producer did not have to incur storage costs. This lender also commented that the grain-as-collateral proposal would further complicate the ethanol project financing process. Four other lenders who did not support this concept said that collateral would not be important to plant financing. None of the lenders would accept grain as collateral if it had restricted marketability--if the grain could only be used for the production of ethanol.

While 11 of the 14 producers/developers said that a grain-as-collateral financing concept is feasible, one-half of them said they would be willing to participate in such a funding proposal. The 11 producers/developers who considered a grain-as-collateral approach to be feasible were generally those with plans for new or expanded ethanol production facilities--9 of 11 who said it was feasible had such plans. Three of the seven producers who showed little interest use internal funds or resources to finance new ethanol facilities, as opposed to obtaining financing from commercial lending sources.

The producers/developers not willing to participate in a grain-as-collateral financing program were generally concerned about being able to obtain the necessary financial backing from lenders under this concept. The concerns of these producers/developers were reflected in their comments to us, which included:

Table 3.2: Industry Views on Grain-Feedstock-as-Inducement Concept

	<u>Number responding</u>	<u>Proposal is feasible</u>		<u>Would participate</u>	
		<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
Lenders	9	5	4	4	5
Producers/ developers	14	11	3	7	7

- The concept is not feasible because of the high level of existing ethanol production capacity, some of which is idle.
- The high cost of storing the collateral grain for a proposed plant limits its usefulness to producers.
- Lenders would probably not approve ethanol project loans supported only by grain-as-collateral.

Comments on grain-feedstock-as-inducement concept

Lenders generally had a more positive attitude toward the grain-feedstock-as-inducement concept. They favored this concept because it allowed producers to use the free grain as an assured, low-cost feedstock and apply the savings of using a free feedstock to repay construction loans. The five lenders who said that the grain-feedstock-as-inducement concept is feasible, as shown in table 3.2, included two who qualified their support. One said the economic conditions necessary to make the concept work are probably not realistic. The other said that it probably would not participate because an ethanol project would be unlikely to generate the longer-term financial business it generally prefers.

Two lenders said the concept would not be feasible because the amount of grain offered as an inducement for financing was too small. One of the lenders explained that the capital costs for the ethanol project under this concept would be higher than under the grain-as-collateral concept because the lender would need better construction guarantees in lieu of collateral. Another lender, citing uncertain market conditions, said that ethanol projects could only obtain commercial financing with the help of government loan guarantees. Also, one lender noted that grain-feedstock-as-inducement would not be feasible because it would expose a lender to too much risk. The lender, without collateral in the form of grain, could be unprotected if ethanol prices drop.

Most producers/developers said grain-feedstock-as-inducement would be feasible, and 7 of 14 thought they would participate in such a program. Producers/developers usually did not express a preference between the grain-feedstock-as-inducement and grain-as-collateral concepts. Three producers/developers, however, distinguished between the financing approaches. One said the grain should be consumed in the financed plant as soon as possible. Another told us that lenders and producers would naturally differ in their financing preference because producers would want to use grain as feedstock as early as possible while lenders would want to delay grain conversion to preserve their interest in a readily marketable asset. Finally, the third producer/developer said that grain-feedstock-as-inducement would be more attractive than grain-as-collateral because he believed lenders would prefer

to finance a plant whose projected operating margins would be significantly higher (if the producer used surplus grain as feedstock) during the plant start-up period.

OTHER SUGGESTIONS FOR ASSISTING THE FUEL ETHANOL INDUSTRY

Producers said that the fuel ethanol industry could also be aided by allowing producers to use surplus grain to survive existing ethanol market conditions or by government actions that do not rely on surplus grain. Several producers pointed out that one of the fuel ethanol industry's current problems is stimulating demand for its product.

Surplus grain to help the ethanol industry survive

Although producers are generally optimistic about the longer-term potential for ethanol, several producers said that survival is a major concern for them over the next several years. Some focused on survival of individual plants, others on survival of the whole fuel ethanol industry. Producers who did not see a need for industry expansion still argued that it would be worthwhile to preserve existing capacity because of its importance to existing grain sales and the cost of trying to rebuild the industry at a future date if it should collapse.

To address the survival problems, producers suggested alternate ways of using surplus federal grain. These included no or reduced cost grain sales and unconditional gifts of grain to ethanol producers. One producer pointed out that a long-term commitment to give grain to an ethanol producer could have the same effect as a grain-feedstock-as-inducement program if the producer felt that expansion was appropriate. Other producers suggested that free grain programs could have built-in incentives. For instance, unconditional gifts of grain could expand and contract with ethanol market conditions. USDA officials told us they were not allowed, by law, to provide unconditional gifts of grain.

Other government action to help the ethanol industry

A majority of ethanol producers say it would be feasible to use surplus federal grain to support expansion of the fuel ethanol industry. However, these experts had varying opinions on how surplus grain could be used to support industry expansion.

Producers/developers suggested several ways to increase ethanol demand:

- Create a uniform national tax exemption for ethanol-blended fuels to replace the varying state exemptions. One producer believed that replacing state exemptions with an increased federal tax exemption, from 6 to 9 cents, could make fuel ethanol competitive in new markets and might increase the demand for ethanol by 50 percent.
- Create a federal alcohol fuel reserve. Surplus federal grain could be converted to ethanol and stored as a higher value commodity with a longer storage life than that of grain.³
- Have the government purchase ethanol or ethanol-blended fuels for use in federally owned vehicles.
- Mandate use of ethanol as a fuel component.
- Restrict the use of competing octane additives, such as toluene and benzene, which producers/developers said are potentially harmful to the environment.

Producers also suggested alternative ways of preserving or expanding current ethanol production, including

- extending the current federal ethanol tax exemption beyond 1992,
- creating a new federal loan guarantee program to support ethanol plant financing, and
- developing a deficiency payment program to support ethanol prices the way some agricultural commodity prices are supported.

CONCLUSIONS

Producers/developers were generally interested in the two financing concepts--grain-as-collateral and grain-feedstock-as-inducement--and about half said they would be willing to participate if economic conditions permitted. On the other hand, few lenders said they believed the grain-as-collateral concept was feasible, and only two of the nine said they might participate. None would participate if the grain use was restricted to the production of ethanol. Lenders were somewhat more positive about the grain-feedstock-as-inducement concept. However, industry experts believed it would not be economically feasible to consider

³In providing agency comments, USDA officials noted that ethanol may not necessarily have a longer storage life than grain because CCC storage facilities must guarantee that the grain can be made available in the same condition as when it was stored.

further industry expansion, regardless of the availability of surplus grain, without comparable increases in ethanol demand. Ethanol producers/developers generally were more interested in using surplus grain to help survive industry's current economic problems rather than to expand industry. Nonetheless, industry experts were generally positive about the longer-term future of ethanol. They believed grain prices will rise more slowly than oil prices in the long run, making ethanol increasingly competitive.

SECTION 4

OTHER CONSIDERATIONS IN USING SURPLUS GRAIN FOR ETHANOL

- o USDA has the authority to use surplus federal grain for ethanol, but restrictions limit how it may be used.
- o The cost to the American taxpayer for storing 2.7 billion bushels of surplus federal grain is about \$860 million per year, and larger surplus inventories are expected through 1987.
- o Using surplus grain to finance additional fuel ethanol plants would not significantly reduce existing surplus inventories and could potentially reduce excise tax revenues.
- o Expanding the fuel ethanol industry could affect others outside the industry, such as oil companies, farmers, and consumers.

USDA'S ABILITY TO USE SURPLUS GRAIN
FOR ETHANOL INDUSTRY EXPANSION

While USDA has authority to use CCC-owned grain to encourage ethanol production,¹ there are some restrictions on its use. Before releasing surplus grain, USDA officials told us they would require that the grain (1) be used exclusively to make fuel ethanol and (2) does not displace grain sales or otherwise cause marketplace disruptions.

USDA officials told us that, if they were designing a grain-for-ethanol financing program under their existing discretionary authority, they would require appropriate safeguards from those receiving the grain to assure these restrictions are met. First, USDA would require assurances from the ethanol producers/developers who receive the grain, and from any lenders who accept that grain as loan collateral, that the grain will only be used to produce ethanol. Appropriate documentation from all parties showing how the grain is used and provisions for on-site USDA monitoring would be required. Second, producers/developers and lenders would have to demonstrate that surplus grain used for these financing concepts does not displace other grain sales. Generally, grain sales would be displaced if producers/developers defaulted on loans and the collateral surplus grain, provided by the CCC, was sold to satisfy debts.² Section 1024 of the Food Security Act of 1985 (Public Law 99-198) amended section 423 of the Agriculture Act of 1949, as amended, to provide that the Secretary of Agriculture shall

"ensure, insofar as possible, that any use of agricultural commodities made available be made in such manner as to encourage increased use and avoid displacing usual marketings of agricultural commodities."

¹The Surplus Agriculture Commodities Disposal Act of 1982 (Public Law 97-358) added section 423 to the Agriculture Act of 1949, granting the Secretary of Agriculture discretionary authority to use surplus CCC stocks for conversion to fuel alcohol. This 1982 act was amended by section 1024 of the Fuel Security Act of 1985.

²Displacement of grain sales could also occur if some or all of the grain that ethanol producers receive from the CCC would have been purchased anyway. This displacement would occur to the extent that these concepts do not stimulate incremental ethanol production. By incremental production we mean that amount above what would have been produced in the absence of these concepts. Estimating how much, if any, of this displacement might occur would be difficult because of necessary assumptions about the demand for ethanol prices and broader market conditions.

Table 4.1: Estimated Amount of Surplus Grain and Associated Annual Storage Costs

(As of March 1, 1987)

<u>Commodity</u>	<u>Surplus grain^a</u> (bushels in millions)	<u>Storage cost per year^b</u> (\$ in millions)
Corn	1,362	424
Wheat	905	291
Other feed grains	<u>460</u>	<u>144</u>
Total	<u>2,727</u>	<u>859</u>

^aGrain quantities are ASCS estimates as of March 1, 1987.

^bStorage costs reflect ASCS' May 1986 cost estimates of: corn at 31.1667 cents/bushel, wheat at 32.103 cents/bushel and other feed grains including barley at 34.6380 cents/bushel, oats at 30.8800 cents/bushel, rye at 35.5108 cents/bushel and sorghum at 30.3979 cents/bushel. According to USDA officials, as of April 1, 1987, these estimates are the most accurate up-to-date numbers available.

USDA officials told us that they would require all parties to a project using surplus grain to certify that, in the case of a loan default, either the government would be given title to the grain or, under agreements where the lender receives title, the grain would be used exclusively to produce ethanol. These assurances, according to these officials, would help prevent the displacement of other grain markets as required by law. However, while these restrictions may prevent the displacement of other markets, they considerably reduce the value of the grain as collateral. Lenders told us that they would not participate in the grain-as-collateral financing concept if there were a restriction on how the grain could be used.

USDA officials also noted other considerations that might influence the availability of grain for these financing concepts. For example, programs that provide free or reduced-price grain to ethanol producers would have to compete with other CCC programs and uses of grain such as PIK or emergency programs. As these program needs change from year to year, so might the availability of surplus grain. Also, surplus grain provided at a value less than its acquisition cost constitutes a loss against the CCC's \$25 billion borrowing limit and may reduce its ability to fund other programs. Finally, USDA officials told us that it is unlikely that USDA would initiate these financing concepts unless directed to by the Congress.

IMPLICATIONS FOR THE FEDERAL GOVERNMENT OF USING SURPLUS GRAIN FOR ETHANOL

A federal program to provide surplus grain to help finance the construction or expansion of fuel ethanol facilities could reduce, to the extent that surplus grain used results in incremental production, some of the large grain storage costs. Such a program, however, is unlikely to significantly reduce the overall grain surplus inventories. Further, these cost savings could be more than offset by potential excise tax reductions. Since our analysis is based on a one-time distribution of surplus grain, it does not consider the additional savings or losses associated with these concepts if they were continued for a longer period of time.

Large inventories of surplus grain currently exist

The CCC currently has huge inventories of federally owned surplus grain. As of March 1987, the CCC-owned wheat, corn and other feed grain inventories exceeded 2.7 billion bushels (table 4.1). In addition, ERS forecasts that the larger surplus

Figure 4.1: Annual Feedstock Requirements for Various Levels of Industry Expansion

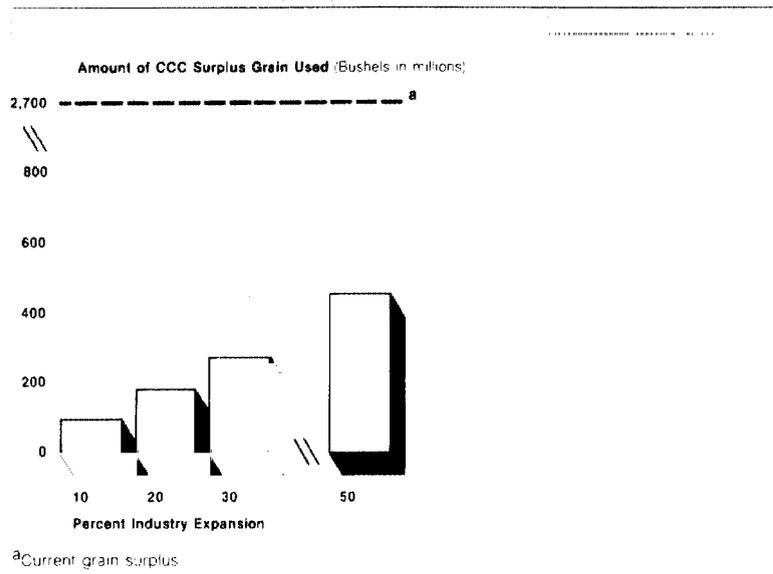
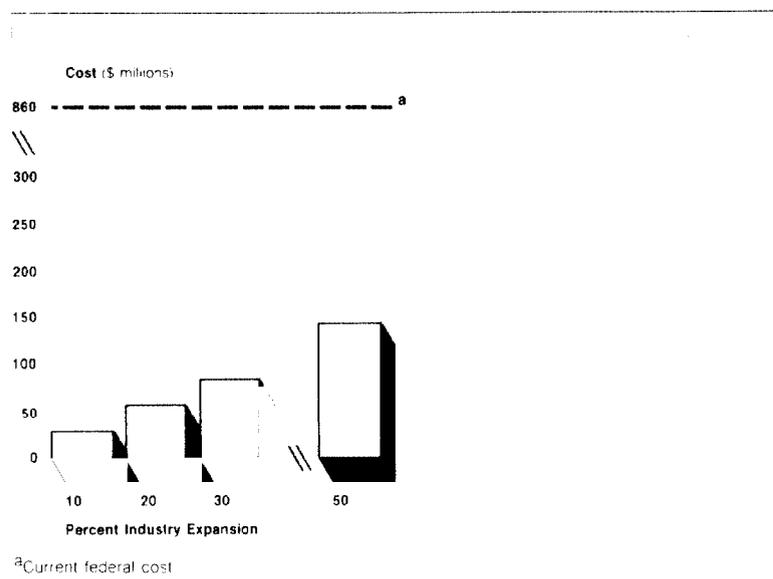


Figure 4.2: Annual Reductions in Federal Government Surplus Grain Storage and Maintenance Costs



inventories will continue in the future. USDA estimates that these surplus inventories will continue through the end of the 1987 crop year. The federal government currently pays annually about 31 cents on average per bushel to store this grain. Table 4.1 also shows that in total the federal government currently pays about \$860 million a year to store and handle these inventories.

Financing concepts have little
impact on surplus grain inventories
and costs

On the basis of our analysis, it appears unlikely that a reasonable expansion of the ethanol industry using the grain-as-collateral or grain-feedstock-as-inducement concepts would substantially reduce surplus grain inventories or government storage and maintenance costs. The amount of grain needed for an expansion of the industry by 10 to 20 percent is small compared with the existing 2.7 billion bushel surplus.

In order to determine the likely impact of an expanding ethanol industry on the CCC's current surplus inventories of grain and associated storage and maintenance costs, we considered the following scenarios: a 10, 20, 30, and 50 percent expansion of the industry. Under each of these expansion scenarios, we considered the amount of grain that would be used and the storage and maintenance cost reductions that would result.³

Assuming producers were given a 3-year supply of grain during the first year of the project, under these concepts, and as shown in figure 4.1, the annual feedstock requirements to expand existing production by 10 to 30 percent would range from about 90 million to 270 million bushels of grain or from about 3 to 10 percent of CCC's current inventory. In order to significantly reduce CCC's current surplus grain inventories, a more substantial expansion of the industry would be needed. For example, a 50 percent industry expansion would result in the usage of about 450 million bushels of grain or about 17 percent of the 2.7 billion bushel inventory. Such a scenario, according to industry experts, is unlikely under existing market conditions.

Figure 4.2 shows the associated reduction in government storage and maintenance costs. Current annual costs of about 31 cents per bushel or almost \$860 million in total could be reduced by \$28 million to \$85 million, or about a 3 to 10 percent reduction in total cost, respectively, for an industry expansion of between 10 to 30 percent. If the industry expanded by 50 percent, using

³We used the 1986 current annual production of about 750 million gallons of ethanol per year as a baseline for these expansion scenarios.

these concepts, the associated reduction in government cost would be about \$142 million, or about 17 percent of total annual storage costs.

Potential offsetting excise tax reductions

Assuming conditions remain the same (e.g., grain storage costs remain constant and ethanol tax exemptions are not eliminated), indirect reductions in federal taxes on the gasoline that is blended with ethanol could be greater than direct reductions in storage costs, provided the grain that is used for ethanol would otherwise have been stored for less than 5 years. Under current federal law, gasoline that is blended with ethanol (commonly termed gasohol) is exempt from 6 cents of the 9 cents in federal excise taxes until 1993. Therefore, prior to termination of this exemption, additional gasohol sales, under these concepts, that result in the displacement of gasoline sales, would result in lower tax revenue than if the full excise tax were collected on gasoline.

This potential reduction in federal revenue could be about \$1.50 for each bushel of surplus grain used. Each bushel of grain can be converted into about 2.5 gallons of ethanol. Since ethanol is blended with gasoline in a 10 percent ethanol, 90 percent gasoline ratio, each 2.5 gallons of ethanol would be blended with 22.5 gallons of gasoline to produce gasohol. Each gallon of gasohol is eligible for the 6-cent excise tax exemption. If the 6-cent per-gallon exemption were applied to 25 gallons of gasohol, there would be a \$1.50 per bushel potential revenue reduction. We did not estimate the total potential revenue reduction because of the uncertainty regarding (1) the continuation of the excise tax exemption to 1993 or beyond, (2) the amount of construction that might occur as a result of using these concepts, and (3) the future demand for ethanol as well as other factors.

OTHER IMPACTS OF AN EXPANDED FUEL ETHANOL INDUSTRY

Using surplus federal grain to expand the fuel ethanol industry would have implications beyond the ethanol industry and USDA's grain managers. There would probably be economic consequences for farmers, oil companies, and consumers as well. An expanded fuel ethanol industry could also affect U.S. foreign trade, energy, and environmental efforts. Various groups and individuals associated with the fuel ethanol industry, such as producers, lenders, other ethanol industry experts, and USDA officials have raised several economic and federal policy implications of the existing and/or an expanded fuel ethanol industry. These include:

- An expanded fuel ethanol industry could provide farmers with additional grain markets, higher grain prices, and increased income; however, the farmers who benefit from higher grain prices might do so at the expense of other farmers (such as livestock producers who would have to pay higher prices for feed);
- An increased use of ethanol/gasoline blended fuels would increase employment opportunities within the fuel ethanol industry but might displace workers in the petroleum industry; and
- Consumers could be provided with a clean-burning, renewable domestic fuel source but might face higher food prices because of the increased market demand for the farmer's grain.

In August 1986, USDA issued a report, Fuel Ethanol and Agriculture: An Economic Assessment (AER number 562), that analyzed a wide range of economic and federal policy impacts attributable to ethanol subsidies and agriculture programs. The study also estimated the impact of an expanding or contracting ethanol industry on the demand for corn, corn prices, and farm income. The study compared USDA's current projection of an ethanol industry with a 1-billion gallon per year production by 1995 to two scenarios: (1) ethanol production that doubles to 2 billion gallons per year by 1995 and (2) a decline in ethanol production to zero gallons by 1995. These scenarios were considered extremes that framed the most likely economic effects of a changing ethanol industry. According to the study, under the first scenario the growth in ethanol production could result in

- an approximate doubling of demand for corn as an ethanol feedstock,
- an increase in corn prices of 8 to 16 cents per bushel, and
- an increase in net farm income, on average, of \$.58 for each additional gallon of ethanol produced.

The study noted, however, that farmers who benefit from higher grain prices would do so at the expense of other farmers. For example, ethanol-induced demand for corn could increase the feed cost for beef, pork, and poultry producers since they use corn for feed. In addition, since ethanol feed by-products compete with soybean meal and other feeds, as the supply of these ethanol by-products increase, the price of competitive products may decline. The study also indicated that an ethanol industry expansion could reduce federal farm program costs. Under the second scenario, the opposite effect occurred--the lower demand for corn reduced corn

prices and farm income. We did not assess the economic analyses present in this study.⁴

CONCLUSIONS

Although CCC currently has sufficient grain available in surplus inventory to support these financing concepts, restrictions in law, which USDA officials say they would impose, would severely limit their attractiveness to lenders. Even if the surplus grain were used to expand the ethanol industry, it is unlikely that the federal government's grain storage costs would be reduced substantially. The amount of grain needed to expand the industry's production by 10 to 20 percent under these concepts would be small in comparison with current surplus grain inventories of about 2.7 billion bushels. Reductions in storage costs for surplus grain could be more than offset by reductions in excise tax revenues.

Producers, lenders, and other industry experts have noted broader economic and federal policy implications of expanding the fuel ethanol industry. For instance, expanding the fuel ethanol industry could have a variety of positive as well as negative impacts on farmers, oil companies, consumers, U.S. foreign trade, energy, and the environment.

⁴This and other studies have noted the potential government savings that could derive from expansion of the ethanol industry. Particularly noted, are possible savings in USDA agricultural commodity deficiency payments (i.e., payments made to farmers that represent the difference between the market price of a commodity and the amount the government agreed to pay the farmer for his expected production). These savings could occur to the extent that increased ethanol consumption caused increased demand for corn, which in turn caused an increase in its market price. Assuming this market price is above the price at which USDA must make these payments, savings would occur. These potential savings from expanded ethanol production are not applicable, however, to the concepts considered in this report. Under these concepts, any increased ethanol production simply results from corn being taken out of the CCC storage and given to producers/developers (either directly as a feedstock or indirectly as loan collateral). This does not increase the demand for corn and, therefore, does not affect the market price of corn.

COMPARISON OF WET AND DRY CORN MILLING PROCESSES

Although ethanol can be produced from virtually any raw material containing sugar or carbohydrates, the vast majority of this country's fuel ethanol is produced from corn. Ethanol is made from corn through either the wet or the dry milling process. The processes are described below and illustrated in figures I.1 and I.2. (See pp. 62, 63.)

In the wet milling process, the various components of the corn kernel are separated in a water solution before they are processed into a variety of products. Large wet milling plants primarily convert the starchy portion of the corn into high-fructose corn syrup, which is marketed as an alternative to sugar. However, the fuel ethanol market enabled the industry, with minimal additional capital investment and relatively minor changes in operations, to divert some of this starch to produce ethanol. Instead of processing the starch into sweeteners, wet processors ferment the sugars into ethanol and distill the crude ethanol into an anhydrous-grade (water-free) fuel.

When ethanol is produced by the dry corn milling process, the kernel is not separated into components before processing but is ground up whole. For centuries, the dry milling process has been used to make corn flour, corn meal, and grits.

When fuel ethanol is wet or dry milled from corn, certain co-products also result. In wet milled corn, the starch portion is used to make ethanol, but the protein and fiber portions remain for use in other products, including corn oil, gluten feed and gluten meal which are used to feed livestock. The major co-product of the dry milling ethanol process is distillers dried grain and solubles, (DDGS), which are sold as animal feed.

In deciding whether to use the wet or dry milling process to produce fuel ethanol, producers consider two main factors: (1) the considerably higher construction costs for wet process facilities, and (2) the producer's ability to market the co-products from the manufacturing process.

Figure I.1: How Fuel Ethanol Is Made Using the Wet Milling Process

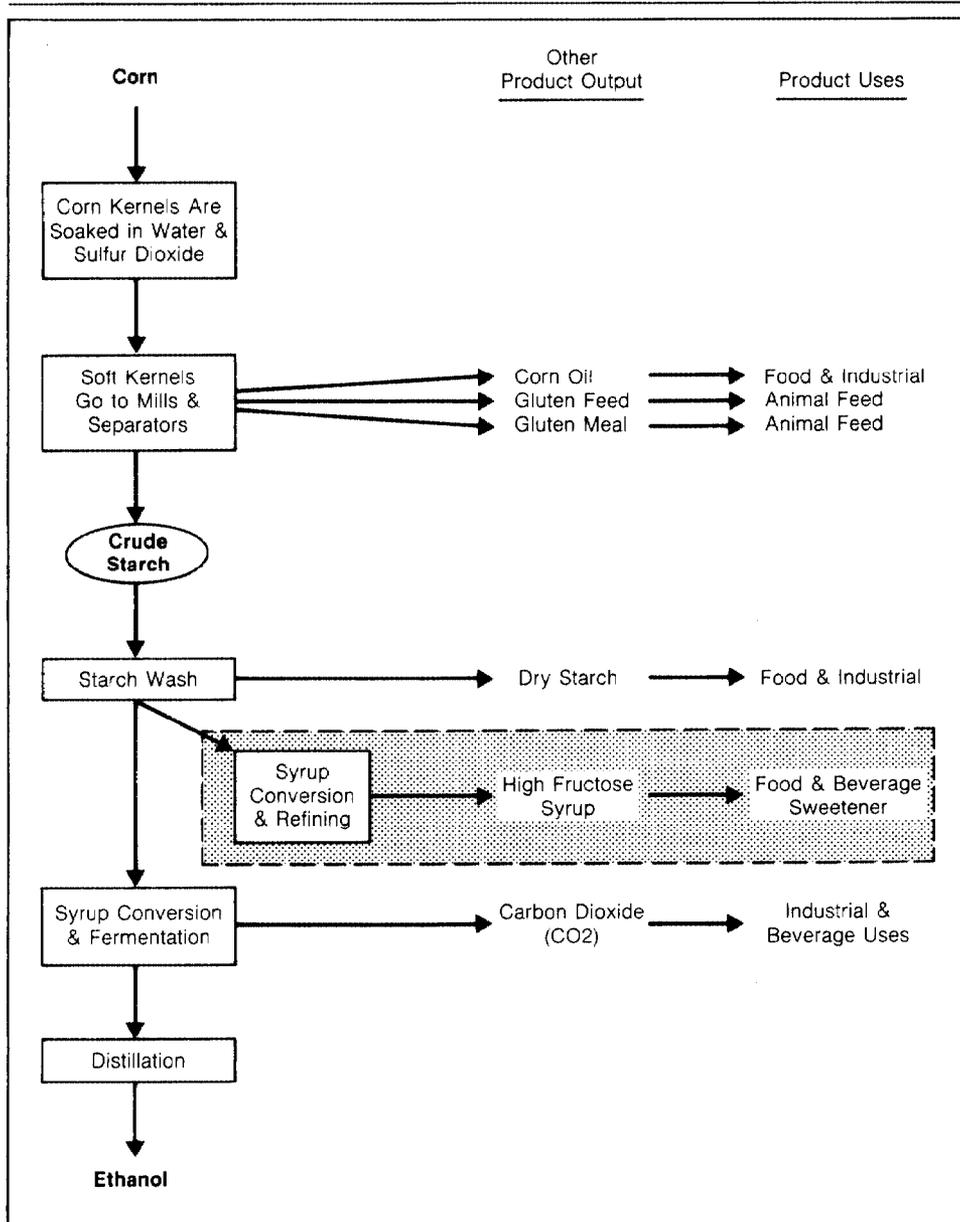
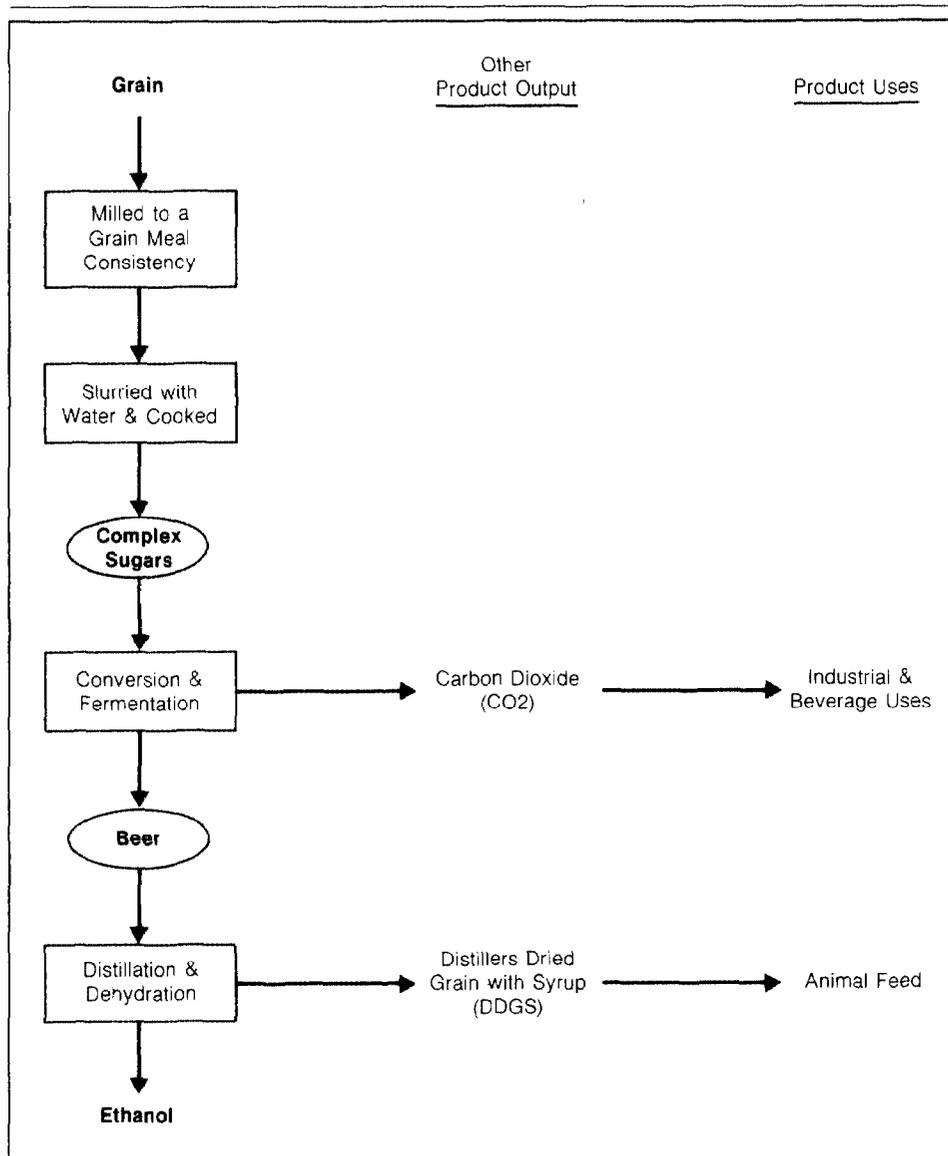


Figure I.2: How Fuel Ethanol Is Made Using the Dry Milling Process



APPENDIX I

APPENDIX I

PRIOR FEDERAL EFFORTS TO ASSIST
THE FUEL ETHANOL INDUSTRY

The federal government has been involved in a variety of efforts to aid the ethanol industry. A summary of some of these programs is presented below.

The 1986 ethanol certificate program

Qualified ethanol producers who acquired grain and converted it to fuel ethanol between May and September 1986 were compensated with negotiable certificates that could be exchanged for CCC-owned commodities. The program was designed as a temporary measure to help ethanol producers survive during a period of low ethanol prices.

The face value of commodity certificates was determined by the monetary equivalent of one bushel of grain for every 2.5 bushels of grain acquired and converted into ethanol, minus the prior month's certificate value. The monetary value of the certificate commodity was set according to local grain market prices.

Thirty-six ethanol producers qualified and participated in the ethanol certificate program. CCC issued certificates worth about \$54 million in CCC commodities, representing about 106 million bushels of grain acquired and converted into fuel ethanol. USDA program officials estimated that the program reduced fuel ethanol producers' feedstock costs by approximately 30 percent.

A side effect of this program was the overproduction of fuel ethanol. According to an official in DOE's Office of Alcohol Fuels, fuel ethanol producers who wanted to take full advantage of the program were, in effect, encouraged to produce at high production capacity levels. This production resulted in a temporary glut of fuel ethanol, which further reduced the already low fuel ethanol prices.

CCC program officials expressed initial concern about the ethanol producers' willingness to comply with program rules and CCC's ability to establish adequate controls. However, after making compliance visits to most of the participating producers, these same officials said they were generally satisfied with the way the program was operating. Agency officials told us that monitoring for compliance was relatively easy because of USDA's requirement that ethanol be made before the certificates were handed out. Subsequently, in March 1987, the USDA's Office of Inspector General reported that producers were generally in compliance with program requirements.

Table II.1: Fuel Ethanol Plants Approved Under DOE's Loan Guarantee Program

<u>Company name and location</u>	<u>Amount of loan guarantee (millions)</u>	<u>Plant capacity/status (gallons in millions)</u>
Guarantee commitments approved for:		
AgriFuels New Iberia, Louisiana	\$ 78.9	35/under construction
New Energy Company of Indiana South Bend, Indiana	126.8	50/operating
Tennol, Inc. Jasper, Tennessee	64.8	25/start-up phase with engineering difficulties
Other projects assisted by DOE: ^a		
Kentucky Agriculture Energy Co. Franklin, Kentucky	9.8 ^b	21/operating
South Point Ethanol South Point, Ohio	24.5 ^c	60/operating

^aThese are cooperative agreements with DOE, not loan guarantees.

^bAlso received guarantee commitment from FmHA totaling \$35.2 million.

^cAlso received guarantee commitment from FmHA totaling \$32.0 million.

The 1982 ethanol demonstration program

In 1982, USDA implemented an ethanol demonstration program. The purpose of the program was to help reduce large deteriorating government grain surpluses by creating an outlet for substandard grain. Two million bushels of low quality grain were sold at low prices to nine ethanol producers. The producers were to manufacture and sell the ethanol and by-products, returning the profit from the sale of the ethanol to USDA and keeping the proceeds from the sale of the by-product.

The program was terminated in October 1983, after only one contract was completed during the year and prospects for completing other contracts appeared dim. A USDA program evaluator concluded that the lack of participation in the demonstration program was due to (1) lack of uniform technologies for converting grain to ethanol, making it difficult to generate reliable ethanol markets; (2) an unacceptable level of expenditure needed to properly monitor the contractors; (3) the unsound financial circumstances of several of the contractors; and (4) the likelihood of the CCC revenue being far below the value of the grain.

The DOE ethanol loan guarantee program

The Energy Security Act authorized DOE to initiate loan guarantees, price supports, purchase agreements or any combination of above-mentioned options to aid in the development of the ethanol industry. According to a DOE official, loan guarantees were chosen because there would be no initial outlay of funds. The loan guarantees funded up to 90 percent of the eligible construction costs of an ethanol plant. Projects were picked after evaluating applications from a single solicitation.

DOE has committed about \$271 million in ethanol plant construction loan guarantees since its program started in 1980. Applications were initially received from 57 projects, 11 of which were selected for conditional commitments by DOE. As of April 1987, three ethanol plants were constructed or under construction with DOE loan guarantee commitments and two conditional commitments remain on plants yet to be built. Table II.1 shows that DOE approved guarantees on plants with production capacities ranging from 25 million to 50 million gallons per year. According to DOE officials, one of the three plants is operating, but they are all currently experiencing difficulties in covering operating costs while ethanol's market price remains low. The New Energy Company of Indiana defaulted on its loans for about \$127 million in December 1986.

Table II.2: Fuel Ethanol Plants Approved Under FmHA's Loan Guarantee Program

<u>Company name and location</u>	<u>Amount of loan guarantee (millions)</u>	<u>Plant capacity/ status (gallons in millions)</u>
<u>Guarantees approved for:</u>		
ADC-I Hastings, Nebraska	\$ 18.0	10.0/Operating; current on its payments.
American Fuels Technologies Federalburg, Maryland	2.25	3.4/Plant closed; loan paid by owners.
Boucher Rural Products Ravenna, Nebraska	0.252	0.168/In liquidation; guarantee paid.
Carolina Alcohol Kingstree, South Carolina	0.446	0.51/In liquidation; guarantee paid.
Clinton-Southeast Joint Venture Douglas, Georgia	1.67	3.0/Plant closed; bankrupt, plan for iquidation, guarantee paid.
Coburn Enterprises Sherman, South Dakota	0.675	1.0/Plant closed; in liquidation, guarantee paid.
Dawn Enterprises Walhalla, North Dakota	18.0	10.0/Closed temporarily; denied request for additional funding.
Farm Fuel Products Storm Lake, Iowa	3.42	2.3/Plant liquidated & sold; proceeds not applied to loan, lawsuit pending against plant builder.
Idahol Fuels Aberdeen, Idaho	0.428	0.35/In liquidation; accepted \$200,000 offer to purchase plant and repay part of loan, guarantee paid on remaining \$275,000. ^a

APPENDIX II

APPENDIX II

Kentucky Agricultural Energy Corp. Franklin, Kentucky	31.7	21.0/Operating; out of bankruptcy, under reorganization plan.
Sepco Inc. Scotland, South Dakota	0.450	0.8/Plant closed; in bankruptcy, case referred to Justice for improper loan servicing & closing.
South Point Ethanol South Point, Ohio	28.8	60.0/Operating; loan guarantee paid, restructuring payment terms.
Outstanding Commitments for Loan Guarantees: ^b		
High Plains Corporation Colwich, Kansas	18.0	10.0/FmHA would not close on the loan; lender appealing, commitment expired December 1986.
Alchem, Limited Grafton, North Dakota	7.56	4.2/Commitment extended to allow change in ethanol feedstock.

^aTotal loan amount on this plan was \$475,000.

^bThese projects could be approved for loan guarantees from FmHA once they meet agreed upon operating conditions.

APPENDIX II

APPENDIX II

The process of approving and completing ethanol plants under the loan guarantee program took a long time, according to a DOE official, because the projects needing loan guarantees tend to include high-risk projects--new companies with little management or technical experience in producing ethanol. Accordingly, banks are often hesitant to finance these "start-up" projects without the support of government loan guarantees. Drawing on their experience with this program, DOE officials cited several problems inherent in the loan guarantee approach:

- Government involvement brings with it additional requirements and processes that are both time-consuming and costly; and
- Loan guarantees artificially alter the marketplace by extending credit to high-risk ventures and reducing available credit for other worthwhile projects.

Other concerns were expressed about the additional time loan guarantees require because of (1) problems in obtaining project backers to provide the necessary financial equity on time, and (2) time-consuming negotiations to determine which project costs are covered by guarantee agreements.

A DOE official told us that if the agency had it to do over again, it would be likely to choose an option other than loan guarantees.

The FmHA ethanol loan guarantee program

The FmHA loan guarantee program differed from the DOE program because builders had to secure their own interim financing for construction but could apply for a loan guarantee at any time. If an application were found to be satisfactory, a conditional guarantee, covering up to 90 percent of the loan, was authorized. However, the FmHA guaranteed loan would not go into effect until the plant was operational for 72 hours and met specific start-up conditions.

FmHA guaranteed loans only up to \$50 million per plant. The FmHA program focused on rural areas; therefore, smaller ethanol plants were often financed. Table II.2 shows that loan guarantees were issued for 12 projects, with guarantees ranging from \$428,000 to \$31.7 million for plants with capacities of 168,000 to 60 million gallons per year. Of the 12 plants receiving guarantee commitments by FmHA, only 3 are still operating as of April 1987, and 2 of these plants have experienced financial difficulties. The three plants still operating are the largest plants guaranteed, with production capacity ranging from 10 million to 60 million gallons.

According to a program official, several of these plants experienced financial difficulties because they were relatively small plants unable to withstand the adverse economic climate affecting the industry.

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